

CLAIMS

1. An electric spindle motor, comprising:

a base plate;

5 a rotatable assembly including a rotatable sleeve extending substantially perpendicular from said base plate along a rotational axis, wherein said rotatable assembly is supported by said base plate;

a stationary shaft securely coupled to said base plate, and extending within said sleeve along said rotational axis and spaced therefrom to define a first clearance gap;

10 a liquid fluid situated within said first clearance gap for providing at least radial stiffness for said rotatable sleeve;

a thrust plate securely coupled to said base plate;

15 a thrust bearing securely coupled to said rotating assembly, wherein said thrust bearing is shaped complementary with said thrust plate and spaced apart therefrom to form a second clearance gap;

a gas fluid situated within said second clearance gap for providing at least axial stiffness for said rotatable assembly;

a stator for causing the rotation of said rotatable assembly; and

20 a magnetic device for moving said rotatable assembly away from said base plate substantially along said rotational axis so that said rotatable assembly is less supported by said base plate during rotation of said rotating assembly.

2. The electric spindle motor of claim 1, wherein said magnetic device
25 comprises a stator lamination with coil securely coupled to said base plate and a magnetic plate securely coupled to said rotatable assembly.

3. The electric spindle motor of claim 1, wherein said magnetic device
30 comprises a stator lamination with coil securely coupled to said rotating assembly and a magnetic plate securely coupled to said base plate.

4. The electric spindle motor of claim 1, further including at least one magnetic seal to reduce leaking of said liquid fluid from said first clearance gap wherein said at least one magnetic seal comprises upper and lower magnetic seals to reduce leaking of said liquid fluid between an upper end of said sleeve and said shaft, and a lower end of said sleeve and said shaft.

5. The electric spindle motor of claim 4, wherein said magnetic seal comprises a sealing ring disposed proximate an end of said sleeve and in contact with a perimeter surface of said shaft, wherein a ferrofluid gap exists between said sealing ring and said shaft to receive a ferrofluid, and a magnetic structure disposed proximate said sealing ring to hold said ferrofluid within said ferrofluid gap, wherein said magnetic structure includes a magnetic ring situated around said sealing ring.

6. The electric spindle motor of claim 5, wherein said ferrofluid gap is formed by a recess in the sealing ring, wherein said ferrofluid gap is formed between a wedge shaped inner surface of said sealing ring and said shaft.

7. The electric spindle motor of claim 1, further including upper and lower liquid absorbers situated proximate respective upper and lower magnetic seals for absorbing said liquid fluid if it leaks.

8. The electric spindle motor of claim 4, wherein said magnetic seal provides an electrical path for discharging static charges from a surface of a disk disposed on said rotatable assembly.

9. An electric spindle motor, comprising:
a base plate;
a sleeve extending substantially perpendicular from said base plate along a rotational axis;
a shaft extending within said sleeve along said rotational axis and spaced therefrom to define a clearance gap;

a liquid fluid situated within said clearance gap for providing at least radial stiffness for said sleeve; and

at least one magnetic seal to reduce leaking of said liquid fluid from said clearance gap.

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10. The electric spindle motor of claim 9, wherein said magnetic seal comprises a sealing ring disposed proximate an end of said sleeve and in contact with a perimeter surface of said shaft, wherein a ferrofluid gap exist between said sealing ring and said shaft to receive a ferrofluid, and a magnetic structure disposed proximate said sealing ring to hold said ferrofluid within said ferrofluid gap.

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11. The electric spindle motor of claim 9, further including a rotatable assembly supported by said base plate.

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12. The electric spindle motor of 11, further including a magnetic device for moving said rotatable assembly away from said base plate substantially along said rotational axis so that said rotating assembly is less supported by said base plate during rotation of said rotating assembly.

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13. The electric spindle motor of claim 12, wherein said magnetic device comprises a stator lamination with coil securely coupled to said base plate and a magnetic plate securely coupled to said rotatable assembly.

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14. The electric spindle motor of claim 12, wherein said magnetic device comprises a stator lamination with coil securely coupled to said rotatable assembly and a magnetic plate securely coupled to said base plate.

15. The electric spindle motor of claim 9, wherein said magnetic seal provides an electrical path for discharging static charges from a surface of disk disposed on said rotatable assembly.

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16. An electric spindle motor, comprising:

a base;

a rotatable member supported by said base and extending therefrom along
5 a rotational axis; and

a magnetic device for moving said rotating member away from said base
substantially along said rotational axis so that said rotatable member is less
supported by said base during rotation of said rotatable member.

10 17. The electric spindle motor of claim 16, wherein said magnetic device
comprises a stator lamination with coil securely coupled to said base and a
magnetic plate securely coupled to said rotatable member.

15 18. The electric spindle motor of claim 16, wherein said magnetic device
comprises a stator lamination with coil securely coupled to said rotatable member
and a magnetic plate securely coupled to said base.

19. The electric spindle motor of claim 16, further including at least one
magnetic seal to reduce leaking of said liquid fluid from said clearance gap.

20 20. The electric spindle motor of claim 19, wherein said magnetic seal
comprises a sealing ring disposed proximate an end of said sleeve and in contact
with a perimeter surface of said shaft, wherein a ferrofluid gap exist between said
sealing ring and said shaft to receive a ferrofluid, and a magnetic structure
25 disposed proximate said sealing ring to hold said ferrofluid within said ferrofluid
gap.

21. The electric spindle motor of claim 20, wherein said magnetic
structure includes a magnetic ring situated around said sealing ring.

30 22. The electric spindle motor of claim 20, wherein said ferrofluid
receiving gap is formed by a recess in the sealing ring, and wherein said ferrofluid

gap is formed between a wedge shaped inner surface of said sealing ring and said shaft.

23. The electric spindle motor of claim 19, wherein said magnetic seal
5 provides an electrical path for discharging static charges from a surface of disk disposed on said rotatable assembly.]